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THE
AMERICAN LAW REGISTER.

SEPTEMBER 1880.

EXPERT TESTIMONY AND THE MICROSCOPIC
EXAMINATION OF BLOOD.

SINCE my articles on the blood question were published in the Law Register, the subject has come up in a number of criminal trials in various parts of the country, in some of which I have been myself engaged; and new discoveries have also been made in the same direction, which may serve to modify, to some extent, the practice in such cases. It is my intention, in the present article, to give the exact status of the question, as far as I am able to do so, and also to present to the readers of the Register facts and opinions which have passed into the current literature on the subject, many of which have been received in the courts as testimony in criminal cases involving the question under discussion.

If I were to confine myself to the simple scientific statement involved in the first part of my subject, but very few pages would be required on which to set forth all the facts in the case, but it is in my experience, and is, moreover, shown by the reports of trials, that much which passes as testimony, and which the scientific expert is called upon perhaps to meet and explain, is just as irrelevant and valueless as most that I have quoted and commented upon in this paper. This fact then, that just such statements and guesses as these are received in court as testimony in important criminal trials, and are, moreover, dignified with the name of expert testimony, must serve as an excuse for the major part of my paper.

The discussion of the value of expert testimony frequently occu-

pies the attention of the courts, and it is made, in a large proportion of cases, the subject of adverse criticism on the part of the learned judges. This will continue to be the case so long as the statement of scientific facts and the *opinions* of scientific men are allowed to be received in the courts, and are classified by them (under the same head) as expert testimony. Scientific testimony, that is, scientific facts, from the very nature of the case, must be admitted to be the very best class of testimony, while the opinions or guesses of scientific men, like all other guesses, are as likely to be wrong as right. It would be just as scientific to classify under the same head the theories of the alchemists and the demonstrations of the chemists as to place *opinions* and the *facts* of science in a similar relation to each other; and the proverbial uncertainty of expert testimony is further due to the practice of the courts themselves in admitting incompetent persons to testify, and also in thus adopting an altogether incorrect classification. If the courts deem it necessary to the settling of disputed questions, to classify facts and opinions under the same head, that of "expert testimony," and to make use of them to the same end, they might do away with the present state of confusion in the matter by calling the one the testimony of fact, and the other the testimony of opinion.

"The essential idea of an *opinion*," say the authorities, "seems to be that it is a matter about which doubt can reasonably exist, as to which two persons can, without absurdity, think differently." Lord President BOYLE said in *Turnbull v. Dods*, 6 Dunlop R. (Scotch) 901; 1 Dickson Ev., § 925 n., in regard to expert testimony as to handwriting: "a set of engravers have been examined on both sides, to whose testimony I pay very little attention, as their *opinions* are very little to be depended upon. In this as in all other cases they take different sides. It seems to be a part of their profession to take different sides." Now this *opinion* of Lord President BOYLE is made by the practice of the courts, and by the classification of the law-writers, to include all kinds of expert testimony. Thus Lord President BOYLE says, "expert testimony is of but little value, and therefore in the present case but little attention should be paid to it." Now the writer, as stated in a former paper (18 Am. L. Reg. N. S. 273), agrees with this where the testimony in question consists of mere opinions; but if the subject under discussion is fully analyzed, and the facts in the case made plain to the jury, so that they are thus enabled to form conclusions for themselves, expert

testimony ceases to be a matter of opinion, so far as the witness is concerned, and becomes, like any other legitimate testimony, matter of fact.

But suppose we apply Lord President BOYLE's *dicta* to the courts themselves. First, forgetting the august title of Lord President, what claim has this man to pronounce as an *expert* upon subjects of which, from the very nature of the case, he could in all probability know nothing? His education as a lawyer would hardly make him competent to judge of the skill of an engraver. Perhaps among "this set of engravers," in the language of the noble lord, there might have been one perfectly competent to pronounce in the case.

But suppose we go further, the grounds for the contemptuous remark that "their opinions are little to be depended upon," consists in the fact that "in this as in all cases they take different sides. It seems to be a part of their profession to take different sides."

During the last session of the Supreme Court of Illinois, out of one hundred and fifty-four cases submitted for review, sixty-six were reversed. And in a recent trial in Canada, a case was decided one way by seven judges, and the reverse by eight other judges. The editor of the legal publication in which this case is reported remarks in regard to it, "he would be a bold man who would venture money on a wager, that were the same case to pass again in review, it would not be reversed from the last decision."

Were one to come to the conclusion, on account of this uncertainty in the decisions of the judges, that it was "in the nature of their profession to take different sides," and therefore this result, who would not appreciate the falsity of the position? It is neither the nature nor the business of either profession "to take different sides," but this condition of things in both cases grows out of the very nature of the idea of what constitutes an opinion, *e. g.*, a "matter about which doubt can reasonably exist." One might fairly argue perhaps that the reasons urged in the one case for the rejection of this species of testimony (*i. e.*, that of opinion), might be urged with equal force against the binding authority of the decisions of the courts. But I leave this for others to discuss.

Passing to my subject, I quote from the Central Law Journal, vol. x., p. 187, "Can human and animal blood be distinguished in case of blood-stains?"

"A criminal case is pending in the Circuit Court of Clark

county (state of Missouri), for murder, against Wm. Young. There is blood on the clothes of the accused, and the question is whether that blood came from a human being or from an animal. The defendant says from an animal."—John S. Phelps (Governor of the State of Missouri).

"To give a reliable judgment in the case of blood-stains being caused by human or animal blood, will be declined by every chemist."—Prof. Schweitzer, *Central Law Journal*, vol. 10, p. 188.

"It is very difficult to distinguish between human blood and that of other higher mammalia."—Dr. Dickson's testimony in report of murder trial in *Pittsburgh Dispatch*, January 27th 1880.

"Can any expert in the universe determine by microscopic or other mode of examination that the blood found in a certain stain is that of a human being and not from some of the higher animals?"—Dr. McCance, *Id.*, March 16th 1880.

"A question was raised in the case mentioned by Gov. Phelps, 'as to whether certain blood-stains on defendant's clothing were from the blood of a human being or from an animal,' and this query induced a thorough examination of the subject by the distinguished gentlemen in the State University." "They have compiled the latest utterances of the best authors and most eminent professors of physical and physiological science upon the subject, and it will furnish the most convenient and reliable information to be obtained in a medico-legal investigation, involving the identification of human blood."

"Dr. Treadwell, of Boston (in the recent trial of Hayden at New Haven, Conn.), who claimed to have experimented extensively with the microscope in the examination of blood corpuscles, was of opinion that he could distinguish human blood from the size and form of the corpuscles."—*Central Law Journal*, vol. 10, p. 183.

Dr. Treadwell says in the *American Monthly Microscopical Journal* for April 1880, referring to this very trial: "I have been always careful to state that there are animals whose blood cannot be distinguished from human blood, and that consequently the latter has nothing in itself by which it can be identified or its origin determined. That I have thus testified in every case in which I have been engaged, and in which the question of the possibility of distinguishing the blood of man from that of other mammals has arisen, I can abundantly prove."

Further, the Central Law Journal says, p. 183. "The conclusion to be drawn from the testimony of all these experts is, that human blood cannot be identified and distinguished with any degree of certainty from the blood of certain of the lower animals by any test now known to the scientific world. A similar conclusion was reached by our distinguished scientists, professors in the University of Missouri, not so much, however, from personal experiments as from an examination of standard authorities upon the subject."

"It is almost impossible to decide between the red blood corpuscles of man and those of the lower animals, especially the mammalia; much more difficult is it to differentiate between them after the blood has become dry."—Dr. Duncan, Professor of Physiology, Missouri University, &c., p. 184.

Dr. Duncan adds in support of this statement from Beale, *The Microscope in Medicine*, 4th ed., p. 266: "I can hardly think in any given case the scientific evidence in favor of a particular blood-stain being caused by human blood will be of a kind that ought to be considered sufficiently conclusive to be adduced for example against a prisoner on trial."

Dr. Duncan forgot to mention (strange neglect for a scientific professor), what immediately follows in Beale. "At the same time cases will occur in which a strong presumption may be of value in weakening or strengthening circumstantial evidence which is not perfectly conclusive."

"There are no certain methods of distinguishing microscopically or chemically the blood of a human being from that of an animal, when it has once been dried on an article of clothing."—Taylor's *Medical Jurisprudence* 1873, p. 309, quoted by Dr. Duncan, *Central Law Journal*, p. 189.

On p. 186 is quoted from Dalton's *Physiology*, 6th ed., p. 253, as if in support of the above proposition: "By microscopic examination of the red blood globules, either when *fresh* or after having been *dried* and again moistened, we can often distinguish the blood of an inferior animal from that of the human subject. * * * It will, however, be impossible to say positively in any instance that they belong to human blood, and not to that of some animal, such as the ape or the dog, whose red globules nearly approach the human size. * * * If it were only required to decide whether a given specimen of blood belonged to man or the musk-deer, for

example, or even to the goat, no doubt the difference in size of the globules would be sufficient to determine the question."

This certainly is a most curious quotation in this connection. Taylor is quoted as saying that it is impossible to distinguish between the blood of a human being and that of an animal when it has once been *dried*, &c. Dalton says we can often distinguish the blood of a human being from that of an inferior animal, "either when fresh or after having been *dried* and again moistened."

Now, Taylor's statement, when the last edition of his work was published, A. D. 1873 (the edition quoted by the Central Law Journal), was, to a certain extent, strictly true. Up to that time it would seem that 300 diameters was the limit of magnifying power used in these examinations. He has embodied this fact in his figures of blood corpuscles given in his work, all of which are drawn to this scale.

I give in Plate 1 a group of corpuscles, inside of one magnified 1620 diameters drawn to the same scale. It will be readily seen how under this low magnifying power, and from the varying conditions in which the corpuscles might chance to be presented for examination, the most skilful observer might well come to such a conclusion, at that time.

In September 1874, Prof. J. G. Richardson, of the University of Pennsylvania, published in the London Microscopical Journal as a sort of reply to this very statement of Dr. Taylor, his method of examining blood corpuscles with high powers.

In this paper he says in regard to Taylor's dictum, "it is strictly true in regard to blood-disks thus *feebly* magnified."

The quotation in the Central Law Journal from Beale to this same end dates back to the same time of low magnifying powers.

Such authorities quoted upon questions, which in the progress of scientific investigation have passed beyond the knowledge of their day, or of the observers from whence their conclusions were taken, are of no value and should have no more weight in a legal trial, than would the opinion of Sir MATHEW HALE in case one should chance to be charged with witchcraft.

The figures in Woodman and Tidy (which is quoted by Dr. Laws as a "standard authority") are drawn to a scale of not more than 500 diameters. The remark of Dr. Richardson, quoted above, would apply with equal force to a magnifying power no higher than this when used in the examination of blood corpuscles.

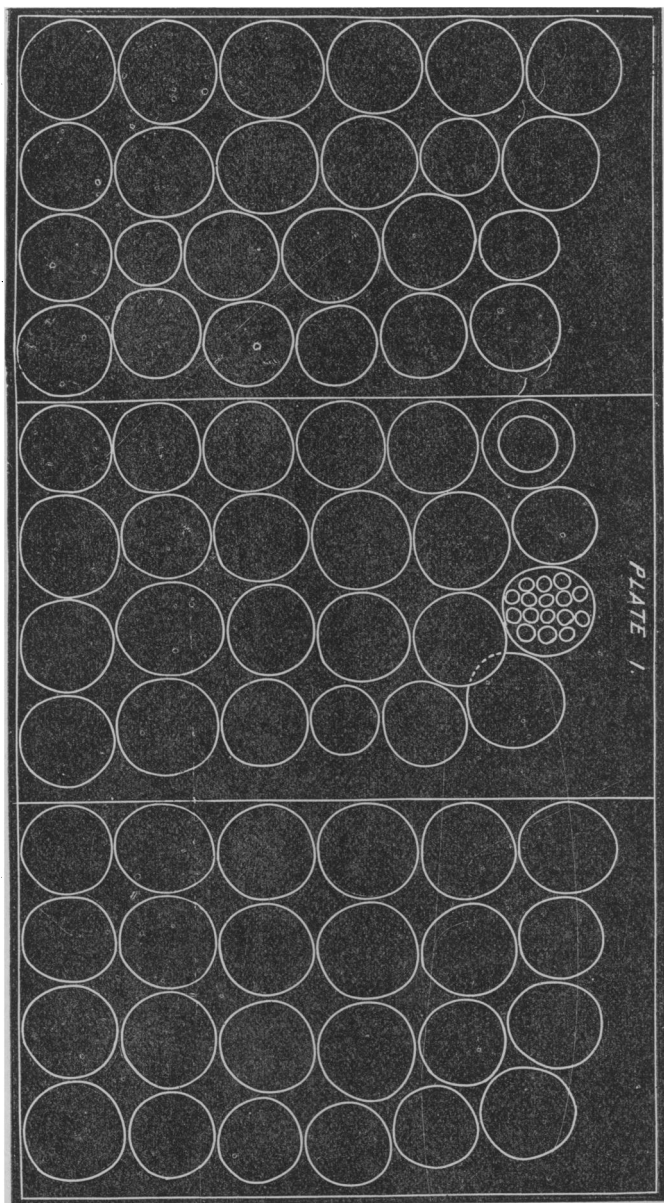


Plate 1. Referred to and described in the body of the paper: it consists of three (3) tables, of a series of six, from one slide magnifying power 1620 diameters. In one of the large circles are seen figures of corpuscles magnified 300 diameters.

Measurement of original drawing (there may be some variation in the engraving.)
 First Table, 1-3338; Second, 1-3345; Third, 1-3310 of an inch

Central Law Journal, p. 185: "It is obvious that an answer to the question as to the possibility of '*pronouncing with unerring certainty between human and animal blood* in case of stains,' &c., involves the fulfilment of the following propositions:

1. "That human blood possesses some constituent or characteristic which is absent from the blood of *all* other animals in health or disease."

2. "That *this* constituent or characteristic is not influenced by age, sex or condition."

3. "That removed from the system it preserves its identity through time, and the active chemical and physical effects of atmospheric influences."

1. This by no means follows, for were it to possess such characteristic with reference to the blood of a single species of animals and to none others, the conditions of the proposition would be broken and it would be thus separated with absolute certainty from that of the animal in question. For illustration, from that of the camel family, which have oval corpuscles.

Further, the terms of the proposition are imperfect, as such constituents must be capable of being shown in order that they may be of value as testimony. And the answer to it is, that human blood does possess such characteristics in size and form which serve to separate it with unerring certainty from that of a large number of other animals, *e. g.*, the musk-deer, whose corpuscles measure the $\frac{1}{12325}$ of an inch, or the goat whose corpuscles measure the $\frac{1}{6368}$ of an inch, and from fish, birds and reptiles, which have oval corpuscles.

2. The second proposition is absolutely false as applied to the first, for the change of this constituent or characteristic might serve to increase the difference between the blood corpuscles of the human animal, and that with which it was to be compared as in early infancy when the corpuscles are much larger than in mature age.

3. It does preserve its peculiar characteristics in a wonderful manner, and to an indefinite extent in many cases, as I shall show by abundant proof further on, "against the chemical and" (other) "physical effects of the atmosphere," as I suppose is meant by the professor, unless he regards chemical action as some kind of spiritual phenomena.

The first proposition might be still further criticised by supposing human blood to possess twice as much of a certain chemical substance

as other animal blood, and the chemist, Prof. Schweitzer, were able to analyze it as he could do the two chlorides of mercury, *e. g.*, calomel (Hg. Cl.) and corrosive sublimate (Hg. Cl.₂), would he not be able to distinguish with unerring certainty in the case? Here, certainly, there would be the same constituents in each.

On page 252 of Dalton's Physiology, quoted above, is the following statement: "In order to be certain that a particular specimen were human blood it would be necessary to show that the smallest of its globules were larger than the largest of those belonging to the animal in question or *vice versa*."

There is certainly some mistake here, which must have been overlooked in the proof. For let us suppose the blood in question to be presented to us as goat's blood, but on measurement we find corpuscles varying within the limits of the $\frac{1}{9600}$ and the $\frac{1}{4000}$ of an inch, while the average shall be the $\frac{1}{3200}$ of an inch; now suppose the extremes of goat's blood to be the $\frac{1}{3600}$ of an inch and the $\frac{1}{7000}$ of an inch, the average being as we have seen $\frac{1}{6366}$ of an inch; who does not see under these conditions that the specimen under examination must be human blood in contradistinction to goat's blood, notwithstanding the largest corpuscles are much larger, microscopically speaking, than the smallest in the other specimen?

The question here is not whether the specimen presented is absolutely human blood, in contradistinction to that of all other animals, but as opposed to goat's blood, or to some animal's blood, the largest corpuscles of which are larger than the smallest in the specimen claimed to be human blood.

It must be kept constantly in view that the real question is not whether human blood or that of any other animal can be identified as such, but whether the blood of other animals can be distinguished from that of man, so that we may be able to decide in a given case, and to what extent this distinction can be made. But this comes up in another part of my paper.

In regard to freshly drawn blood being necessary in order to get measurements of blood corpuscles, this is far from being the fact. I quote from a former paper of my own, in which I say, "I have slides prepared twelve and twenty years ago in which the measurements of to-day are the same as recorded when they were first made. Nor is this unchangeableness confined to those cases in which the blood was first prepared or received on glass slides. I have covered slides on which the corpuscles lie loose, as they were

separated from various substances some two years since. These corpuscles measure to-day, in accordance with their record, which is given in the American Law Register 1878, vol. 17, p. 558, having been previously measured from specimens of the same blood in each case received upon glass slides, and at the same time upon various substances other than glass.

Thus I have put blood upon leather in the form of shoes and gloves, book covers, &c., wood, painted and unpainted; paper, glazed, sized and unsized; woollen cloths of various kinds, silk cloth, cotton and linen cloth, starched, sized and unsized; upon metallic surfaces, iron, steel, tin, copper, brass, silver, lead, &c., upon brick and glazed earthen and china ware, upon stone polished and unpolished, upon buttons and combs, composed of a great variety of substances, &c., &c. Specimens of the same kind of blood were put upon glass at the same time, and the "*transferred*" corpuscles from these various substances, and those originally on the glass were formed into tables and measured side by side, giving results as near together as in case of similar tables from the same original slides.

The slides referred to and also the corresponding tables have been preserved, and are at the service of all interested parties

It is upon the unchangeable character of blood corpuscles, under certain conditions, that all my calculations have been based. As I have said in a former paper, I use the word transfer (not restore), as describing my method of preparing blood corpuscles (taken from other substances where they may chance to have been received), and arranging them on the glass slides in order that they may be measured. Thus far I have been successful in my examinations in these cases, without using any fluid or solvent to restore the corpuscles to their normal size. To what extent such restoration can be done, remains as it regards myself a question subject to the results of a series of experiments long since begun. These experiments consist in making blood spots on various substances and at the same time preparing glass slides with some of the same blood. The corpuscles on these slides are to serve as standards for future measurements of the restored corpuscles from the blood spots. In the Law Register, vol. 17, p. 554, I say, "Blood corpuscles when drying on surfaces on which they do not slide or 'crawl' during the process, preserve their areas unchanged; provided (I add), the substances themselves on which the blood is received, retain their original form." Blood corpuscles with the serum and fibrine which constitute the

fluid portion of the blood, form in drying a coat or thin glaze, which is quite hard and brittle.

In the process of transferring them from the substances on which they have been received, they mostly separate from the other constituents, and appear mainly in the form of whole corpuscles; sometimes they are broken. Under these conditions, unless some solvent or other destructive agent is brought to act upon them, they retain their form with almost as much tenacity as would be the fact, were they constituted of glass or metal. After a certain lapse of time, blood spots may be soaked for weeks in water without appearing in the least affected by it. I have experimented many times with glass slides covered with a thin coating of blood, allowing them to remain for several days in water, then drying them, and afterwards examining the corpuscles under the microscope, without finding any apparent change.

This character of unchangeableness of the red blood corpuscles through lapse of time, under ordinary physical agencies, is recognised by all the authorities, I think. MM. Briand, Chaude and De Claubry (*Manuel Complet de Medicine Legale*, Paris, 1852, p. 789), declare that, however great may be the age of the spots, microscopical examination will nevertheless reveal the blood globules. Those on which M. Robin has made his experiments, dated back from eight to twelve years. After describing the "soaking-out" process, these authors say: "The globules which occupy the edges of the groups, *alone* show their regular form, while the others have become somewhat polyhedral during dessication." This, I think, may be the fact in regard to the so-called "restored corpuscles," of other observers; that the fluids used for the purpose of producing this "restoration" of the corpuscles, that is, of expanding the shrunken ones to their normal circular form, have no such effect, but merely serve to float them apart from the other forms, with which they are connected, broken pieces of dried serum, fibrine, &c. In my experiments, benzine and other fluids in which blood corpuscles are not in the least degree soluble, serve the same purpose of restoration, as the fluid used as above; the corpuscles on the edges of the groups alone retaining their regular shape and size; the others remaining polyhedral or shrunken out of shape, and much reduced in size. In the *Medical Times*, vol. vii., p. 44, are the following statements from Dr. Richardson and Prof. Wormley:

"Dr. Richardson said he had made numerous investigations upon

blood-stains, on muslin and linen cloth, after at least a year's exposure, with entire success, and inquired of Prof. Wormley whether he had ever detected any difference in the size of blood corpuscles soaked out from stains on linen, wood, &c., and those from spots on paper or glass.

"Prof. Wormley replied that he had not found any variation in corpuscles from blood-stains dried on a great variety of objects, and kinds of fabrics."

Dr. Richardson says, in *London Microscopical Journal* for Sept. 1874: "The experience of Prof. Leidy and Prof. Wormley accords with mine, in that they have never seen the drying or remoistening of red blood corpuscles cause them to expand. From this it would seem to follow, that the expression, 'restore the corpuscles,' is used incorrectly, as there can be no restoration other than the bringing of them back to their normal size. This, also, goes to prove what I have said before on this point."

As it regards the unchangeableness of blood corpuscles through lapse of time, Dr. Richardson says in this same paper, that blood spots, which he had examined five years previous, gave corpuscles unchanged in size.

R. U. PIPER.

Chicago, June 1880.

(*To be continued.*)

RECENT ENGLISH DECISIONS.

Court of Appeal (from Exchequer Division).

LEIGH v. JACK.

The plaintiff's testator conveyed to the defendant, or his predecessors in title, two pieces of land adjoining a strip of land intended by the testator for a highway. For more than twenty years before action, the defendant made some use of the strip of land for business purposes. Within twenty years, both the plaintiff or the plaintiff's testator and the defendant had repaired some railings separating the strip of land from an adjoining highway, and within twenty years the defendant had first enclosed a portion and afterwards fenced it in at either end. In an action to recover possession of the strip of land, *held* (affirming the decision of the Exchequer Division), that the presumption that the soil to the middle of a highway belongs to the owner of the adjoining land, does not arise where such land adjoins an intended highway never dedicated to the public. *Held, also*, that the plaintiff had not been dispossessed by the defendant, nor had the plaintiff discontinued possession within section 3 of the Statute of Limitations.